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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/066,920	02/04/2002	Takenori Sekijima	P/1071-1539	4354

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EXAMINER	
SONG, MATTHEW J	
ART UNIT	**PAPER NUMBER**
1765	

DATE MAILED: 09/22/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/066,920	SEKIJIMA ET AL.	
	Examiner	Art Unit	
	Matthew J Song	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 June 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4,8-10 and 15-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,8-10 and 15-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 2, 3, 8, 9 and 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sekijima et al (US 6,039,802) or Kimura et al (US 4,256,531) in view of Baghadi et al (US 4,196,041).

Sekijima et al discloses a single crystal growth method, which allows single crystal to be grown stable while controlling its growth orientation. The method comprises the steps of holding a polycrystalline rod and seed crystal within a heating furnace; heating the polycrystalline rod to form a melt zone and growing a single crystal by moving a melt zone (Abstract and Figs 1-5). Sekijima et al also discloses the polycrystalline rod may be a thin crystal having a fibrous shape

of less than 3 mm in diameter (col 4, ln 15-25). Sekijima et al also discloses the single crystal growth method is self-solvent floating zone and the polycrystal is YIG or an oxide superconductor such as YBCO (col 3, ln 25-67). Sekijima et al also discloses the density of the raw material may be increased and a good quality crystal can be grown with a high yield (col 2, ln 50-67).

Kimura et al discloses a method of producing a single crystal of yttrium-iron garnet by a floating zone method (Abstract). Kimura et al also teaches the shape of the molded mixture can be any rod type as it is used in the floating zone method and a cylindrical rod having a diameter of 1 mm to 10 cm is preferable (col 4, ln 10-20). Kimura et al also discloses a molded mixture of $R_3M_5O_{12}$, where R represents Y and optionally other rare earth elements (col 4, ln 55-65 and col 2, ln 10-40). Also, Kimura et al teaches the size of the rod and single crystal product has approximately the same size (col 7, ln 1-35).

Sekijima et al or Kimura et al does not teach manufacturing a single crystal without using any seed crystal.

In a method of converting a polycrystalline sheet into a monocrystalline sheet, note entire reference, Baghdadi et al teaches a method of forming a monocrystalline material from a polycrystalline material without requiring the use of a seed crystal. Baghdadi et al teaches the formation of a region of a sheet having a small width compared to the width of the remainder of the sheet and a molten zone is formed in the small width region of the sheet, which is allowed to solidify into a single crystal (Abstract and col 1, ln 20-35). Baghdadi et al also teaches the method is low in cost and a high volume process (col 1, ln 35-50 and col 4, ln 35-40). Baghdadi et al also teaches other semiconductor materials and compound semiconductor materials and the

like may be employed (col 2, ln 30-40). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Sekijima et al or Kimura et al with Baghdadi et al's method of forming a single crystal using a molten zone method, which does not require a seed crystal, because the process is inexpensive and capable of high volume (col 1, ln 35-45), which is desirable.

The combination of Sekijima et al and Baghdadi et al or the combination of Kimura et al and Baghadi et al is silent to the crystal grows in the direction normal to the densest surface. However, this is inherent to the combination of Sekijima et al and Baghdadi et al or the combination of Kimura et al and Baghadi et al because the combination of Sekijima et al and Baghdadi et al or the combination of Kimura et al and Baghadi et al teaches a similar method of float zone growth. Also the molten zone is inherently less dense than a growing single crystal therefore the growth inherently occurs in a direction normal the growing single crystal, the densest surface.

Referring to claim 8, the Examiner has interpreted the claim to require a process of forming a single crystal, which does not use a seed crystal, and a method of forming a single crystal without using a seed crystal is taught by Baghadi et al.

2. Claims 4 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sekijima et al (US 6,039,802) or Kimura et al (US 4,256,531) in view of Baghadi et al (US 4,196,041) as applied to claims 1-3, 8-9 and 11-17 above, and further in view of Cordova-Plaza et al (US 5,082,349) or Kobayashi et al (US 4,323,418).

The combination of Sekijima et al and Baghadi et al or the combination of Kimura et al and Baghadi et al teaches all of the limitations of claim 4, as discussed previously, except that step (b) is performed using the Laser Heated Pedestal Growth Method.

In a method of manufacturing single crystals, Cordova-Plaza et al teaches single crystal fibers have been manufactured using the laser heated pedestal growth method, a variant of the float zone process. And in such a method, the upper end of a source rod of crystal material is heated with a focused laser beam (col 2, ln 1-67). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Sekijima et al and Baghadi et al or the combination of Kimura et al and Baghadi et al with Cordova-Plaza et al's laser heated pedestal growth method utilizing a laser beam to form a molten zone because heating with a laser beam to form a molten zone is well known variant to the float zone method of crystal growth.

In a method of growing single crystals, note entire reference, Kobayashi et al teaches a floating zone technique, where a feed rod is heated into a molten zone by radio frequency heating or laser heating, this reads on applicant's laser heated pedestal growth method, and the molten zone is transferred, thereby turning the feed rod into a single crystal (col 1, ln 10-55). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Sekijima et al and Baghadi et al or the combination of Kimura et al and Baghadi et al's heating with Kobayashi's laser heating because substitution of known equivalents for the same purpose is held to be obvious (MPEP 2144.06).

Response to Arguments

3. Applicant's arguments filed 6/22/2004 have been fully considered but they are not persuasive.

Applicants' argument that Baghdadi is not related to manufacturing a single crystal from a raw material polycrystalline rod is noted but is not found persuasive. Baghdadi et al teaches a process of converting a polycrystalline material into a single crystal material without the use of a seed crystal (Abstract). The difference between Sekijima et al and Kimura et al, which is combined with Baghdadi, is the geometry of the polycrystalline material. Sekijima and Kimura teach polycrystalline rods are converted into monocrystalline rods and Baghdadi teaches sheets of polycrystalline material. Also, Sekijima, Kimura and Baghdadi are all related because they convert polycrystalline material into single crystalline material through zone melting ('041 title; '802 col 2, ln 50-67; '531 abstract). Therefore, a person of ordinary skill in the art would have found it obvious at the time of the invention to combine methods of converting polycrystalline material into single crystalline materials using zone melting regardless of the starting geometry.

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, the elimination of seed crystals would reduce costs, as taught by Baghdadi. Furthermore, the elimination of a seed crystal in a crystal growing process is well known in the art to reduce costs, as evidenced by Hagi et al (US 6,402,838), note column 4, lines 35-40, and it

also well known that the cost of seed crystals affects the cost to produce a single crystal, as evidenced by Izumi et al (US 6,210,477), note column 6, lines 30-35. Therefore, eliminating a seed crystal will reduce costs, which is desirable.

Applicants argument that the crystal grows in a direction normal to the densest surface is not inherent to the prior art of record is noted but is not found persuasive. Applicants allege that inherency cannot be based on an assertion that methods of similar patents or an assumed density of various zones. The Examiner maintains that a crystal grows in a direction normal to the densest surface is inherent to a float zone process, because the process is similar to that which is taught by applicants and the prior art of record. Also, applicants have not properly rebutted the Examiners inherency position. Once the Examiner presents evidence or reasoning tending to show inherency, the burden shifts to the applicant to show an unobvious difference (MPEP 2112), which the applicants have not shown.

Applicants' argument that a 4mm process is similar process of 3mm but does not produce a desired result is noted but is not found persuasive. Firstly, the similar process taught by the prior art is for a 3mm or less diameter rod, note col 4, ln 15-21 or Sekijima et al; therefore applicants' argument is not found persuasive because the processes are identical in that respect. Also, applicants have not shown that a 4mm will not grow in the direction normal to the densest surface, merely that a result will not be desirable. The Examiner maintains a float zone process inherently requires growth in a direction normal to the densest surface.

Conclusion

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Asahi et al (US 5,871,580) teaches vertical Bridgman and vertical gradient freeze method of single crystal growth does not require a seed crystal (col 1, ln 10-30).

Wysocki et al (US 5,069,743) teaches a method of making a single crystal without using a seed crystal in a floating zone method (col 5, ln 15-20 and Abstract).

Merriam-Webster's Dictionary defines oxide to mean a binary compound of oxygen with a more electropositive element or group (pg 832).

Kimata et al (JP 05-025148) teaches an organic single crystal formed using the Bridgman-Stockburger method to form a crystal of 3 mm in diameter (Abstract).

Okazaki et al (US 4,981,613) teaches single crystals formed by the Bridgman method having a diameter of 2 micrometers (col 15, ln 35-50).

Hagi et al (US 6,402,838) teaches a method of crystal growth not requiring a seed crystal, which suppresses costs (col 4, ln 15-40).

Izumi et al (US 6,210,477) teaches since a cheaper seed crystal can be used, the cost of pulling a single crystal can be reduced (col 6, ln 20-35), which is a teaching that seed crystals affect production costs.

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO

MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J Song whose telephone number is 571-272-1468. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Matthew J Song
Examiner
Art Unit 1765

MJS

NADINE G. NORTON
SUPERVISORY PATENT EXAMINER